VISIÓN ELECTRÓNICA

Francisco José de Caldas y Thenorio: General engineer of a rebel army

He was born in Popayan (Colombia) probably in the early October of 1768 and he died in Bogota (Colombia), another October of 1816, after being shot in the back.

He received a Bachelor degree in Law around 1791 and because of different circumstances, he dedicated himself to the itinerant observation of nature and its diversity. Thanks to his talent for mathematics and experimental physics, along with the context of the New Kingdom of Granada and its study of the application of the disciplines of modern science for the benefit of the Empire, he found a strong motivation to come upon surprising results, through self-teaching and in very precarious conditions. This put him in the edge of techno-science of the time. For example, in 1796, he measured the height of one of Bogota's Guadalupe "guardian" hill (3.275m); also, he mapped the *Magdalena* River from Neiva until its source and he calculated the meridian of the equator. In 1797, he mapped perfectly of the Timana county (Huila state), based on a total eclipse of the Moon in early December. At the same time, he built a telescope, which allowed him to observe Saturn's system rings, the Moons of Jupiter and its dark zones. Additionally, he calculated the distance from Popayan to the west meridian of Cadiz.

Around the same time, he discovered a method to measure the height of mountains (never before used in Tropical America) based on the principle of thermal hypsometry, which states that the boiling temperature of water is commensurate with the atmospheric pressure. This means that the altitude of a place can be determined by using a thermometer. The mathematical modeling of such discovery was expressed in the following linear formula: $Z = a \pm \frac{12(b-d)}{0,974}$. Here, "Z" corresponds to the barometric altitude; "b" is the height in the barometer lines at the level of Popayan;

"*b*" are the boiling water temperatures of Popayan; and "*d*" corresponds to the temperatures in the place from which the barometric altitude was sought. In addition, Caldas reached the constant of proportionality (0,974) by means of experiments, in spite of the limitations of the time. Together with He also invented an hypsometer around 1802 and, together with Alexander von Humboldt and Aimé Bonpland, he strengthened his development as a scientist. After joining the Botanical Expedition, he carried out systematic studies of the species of quinine, and calculations of the coordinates of Quito, which were fundamental to design the general map of New Granada. He returned to Santafé de Bogotá at the end of 1805 and he brought with himself an herbarium, in which plants were organized according to the altitude they were found. He also brought the first collection of butterflies in the history of America, which was discovered recently and included subspecies that have not been classified, yet. Caldas took over the National Astronomical Observatory and wrote his "Andes profiles", a remarkable piece of topographic, botanic and geodesic studies. Around 1809, the Viceroyalty of New Granada confirmed his position as Director of the Observatory and assigned him the Chair of Mathematics at Colegio Mayor Nuestra Señora del Rosario, where he had coursed is bachelor degree years before. In 1811, Caldas joined the body of Military Engineers in Antioquia and there he drew precise schematics, which gave rigour to the study of fortification and artillery; he built gunpowder mills and invented armament.

All in all, neither his political beliefs nor his shy and compassionate attitude, along with his health problems, can be enough to analyze his part in the history of this country. His legacy for Colombians cannot be measured, but can be synthetized in his role as the architect of a current social endeavor as it is Engineering, in singular and in capital letters, at the service of the country.

This perspective integrated a political view that enables well-educated men take charge of their own destinies. What is more, he created a community around Academy as the pioneer of scientific publications in Colombia with the journal "Semanario del Nuevo Reyno de Granada". Following Galileo's footsteps, who was accused of being subversive because of his ideas and threatened to death as lesson for his "defiance", Caldas also made the choice of being the General Engineer of a rebel army, but only when his human condition was weakened to the breaking point: a major insult for the revolutionary wisdom.

Visión Electrónica year. 9 number. 2, july-december 2015, p.p. 168-169,
ISSN 1909-9746, ISSN-E 2248-4728-Bogotá (Colombia)